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Procedia Engineering 29 (2012) 1578 – 1583

Procedia Engineering

www.elsevier.com/locate/procedia

2012 International Workshop on Information and Electronics Engineering (IWIEE)

# An Empirical Research on Poor Rural Agricultural Information Technology Services to Adopt

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**Abstract**

In the process of promoting agricultural information, "Last Mile" problem is the long plagued to adopt information technology problems for farmers.This paper based on UTAUT to analyse the impact on farmers' adoption of information technology services factors with the collection of specific data.The results show that the main factors are effort expect,performance expect,social influence and facilitating conditions,howerver,it is different in other circumstances that farmers pay more attention to the operation of the system simple and functional practicality.



*Keywords:*UTAUT;Agricultural information;Last Mile;Technology adoption

## 1. Introduction

With the development of agricultural industry and marketing, the role of information is a strong force for increasingly becoming agricultural production and rural economic development. Especially in poor remote ethnic minority areas, it is undoubtedly the best path to catch up with developed regions. “Last Mile” is described as the problem, which the information technology was linked to countryside, but villagers can not effectively use it[1]. Because of this, it has restricted the bottleneck in the development of agricultural information. In this paper, we analyzed agricultural information "Last Mile" of the status in ethnic minority areas, and then revealed its problems, mining information needs and proposed policy.

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doi:10.1016/j.proeng.2012.01.176

## 2. Unified Theory of Acceptance and Use of Technology(UTAUT) model

After the 1980s, people's lives have been gradually affecting computer information technology, while the new information products are emerging. In order to analyze the behavior of user adoption process for the new information products, Davis[2] proposed the technology acceptance model(TAM) and the model was amended again by Davis[3]. In recent 20 years, the number of scholars have been carried out in-depth study it, and it has become the most common model of information systems, however, TAM has also natural flaws:it can only interpreted user behavior of system about 40%.

Venkatesh&Davis[4] summarized the previous research results, such as Social Cognitive Theory, Innovation Diffusion Theory, Technology Task Matching Model, Theory of Reasoned Action, Theory of Planned Behavior,and then they proposed UTAUT model. The model consists of four core elements: performance expectations, efforts expectations, social influence and facilitating conditions.Otherwise, it consists of four adjustment variables: gender, age, experience and use of voluntary. The empirical results show: UTAUT can interpreted user action up to 70% more effective than the TAM model.

In this study, in order to specifically describe the usefulness of information technology, we have adopted "Tobacco Information System" as the sample system of investigation which use in a rural areas of Guizhou province.The system can provide a variety of informations for farmers,such as crops cultivation, acquisition policy , real-time information , weather conditions, so it has a very strong practicality.

## 3. Research model and hypothesis

Next, we described the related elements of the model about UTAUT.

(1)Performance Expectancy: people want to use the information technology to improve efficiency and access to performance. The factors include the following main elements:①Perceived usefulness, users can use the system to their own perception of the benefits.②Extrinsic motivation, after using the system users perceive the additional revenue.③Job-Fit, Functions provided by the system to adapt to the extent of his work.④Relative advantage, new systems can bring more benefits than existing systems;⑤Outcome expectations, Users get the performance improved results and achieve their personal value to meet the expectations.

Davis' research shows:people usually believe that they are more willing to adopt the use it if the information system can improve performance. Rogers' research also shows that an innovative product can rapidly spread because of its technological superiority[5].In TAM,usefulness of the model that can promote the use of information systems,so performance expectations are derived from this in UTAUT theory. Therefore,the first hypothesis states:

*H1:Performance Expectancy has a positive influence to farmer on the behavioural intention towards adopting.*

(2)Effort Expectancy(EE):the degree of ease to someone which an individual believes in the association with the use of the system. The factors include the following main elements:①Ease of cognitive, users perceived the system easy to use cognitive.②Cognitive complexity, user perceived complexity of the system.③Simplicity and ease of use,the easy and simple degree is perceived by user.

At present, Information services in remote rural areas of China is still very backward,so most of the farmers obtain information by means of mobile short messages and internet.Furthermore, communication flow is required fee and it is lack for agricultural information service. H. Dehua et al[6] have shown that the use of information technology for rural consumers have a significant positive impact.Therefore,the second hypothesis states:

*H2: Effort Expectancy has a positive influence to farmer on the behavioural intention towards adopting.*

(3)Social Influnce,an individual perceives that important others believe the person should use the new system. The factors include the following main elements:①Subjective norms, those who were their close relationship are in favor of the extent of their actions.②Social factors, in their lives and social environmental conditions, their own behavior transformed into the extent of group action.③External reputation,the degree of social prestige and status was promoted for using the new system.

Venkatesh and Davis[7] argue a system is very useful if people accept a friend or respect suggestion. At the same time, he would think this system is indeed useful, to improve the perceived usefulness of the system, and generate the motivation to use the system.Therefore,the third hypothesis states:

*H3: Social Influnce has a positive influence to farmer on the behavioural intention towards adopting.*

(4)Facilitating Conditions is defined as the degree of believing in the existence of the technical and organizational infrastructure to support the usage of a new system. The factors include the following main elements:①Perceived behavioural control, when individuals use the new system, they felt by internal and external conditions on the constraints of their own behavior.②Facilitating conditions, the external environment provides an easy objective conditions to use the new system. ③Compatibility, the new system can accommodate the extent of the existing system.

"Tobacco Information System" is a simple means to get information for farmers. It is usually installed in place where the farmers sell tobacco or rural culture and leisure venues, to provide information to facilitate the farmers. The results show that environmental factors can promote the interest of users'motivation, affect their behavior and attitude[8].Therefore,the forth hypothesis states:

*H4:Facilitating Conditions has a positive influence to farmer on the behavioural action towards adopting.*

(5)The user come into being behavioral intention from above factors including information technology, environmental conditions, as well as their perception.Only in this way can users generate specific actions.Therefore, the fifth hypothesis states:

*H5:Behavioral Intention has a positive influence to farmer on the specific action towards adopting.*

## 4. Data collection and analysis

In the questionnaire,we full take account of characteristic in countryside information service,and then based on the UTAUT to use effort expectations, performance expectations, social influence and facilitating conditions for the independent variables, willingness to use and the use of behavior as outcome variables.At last ,we got the scale of 24 questions.

The sample of this survey is mainly received from farmers in remote rural areas of Guizhou province. In these remote rural areas, poor soils and harsh natural conditions, the main crop is tobacco cultivation, but also the family's main source of income. In recent years, government has put a lot of money building the information infrastructure in rural areas, to improve the status of the information-poor region, but it is difficult to achieve agricultural information because of the "Last Mile" problem. With the economic efficiency of the tobacco companies,the rural area were accessed to investment in information technology. "Tobacco Information System" is terminal equipment by specially designed for solving the farmers' information. In the samples, we mainly surveyed the farmers from growing tobacco family. The survey sites was in the tobacco warehouse or at home to visit the farmers. A total of 400 questionnaires were delivered and returned 288 responses. At last,there are 241 valid questionnaires after excluding missed, mispresented 47, the effective response rate 60.25% .distribution of the sample as shown in Table 1.

Table 1 Demographic statistics of survey sample

| Sex | | Age | | Degree | | Occupation | |
|---|---|---|---|---|---|---|---|
| sex | % | age | % | education | % | Occupation | % |
| Man | 61.2% | ≦20 | 1.5% | ≦primary | 77.1% | farmer | 92% |
| Woman | 38.8% | 21-50 | 82.3% | junior school | 21.4% | Technician | 6.5% |
| | | ≧51 | 16.2% | ≧high school | 1.5% | others | 1.5% |

This paper uses structural equation modeling(SEM) and AMOS software for data processing. Structural equation model is a statistical analysis methods,which can handle multi-variable complex research data,therefore, it is widely used in economic social behavioral sciences and other fields.

In this study, the reliability is internal consistency reliability. The reliability constrasted between subjects to examine the scale measured in all subjects the same content or characteristics. We adopted Cronbach's α coefficient generally for scale reliability. The results show that Cronbach's α of each factor has met the Hair' proposed standard, the threshold limit of 0.7,so scale's internal consistency is acceptable.

In SEM analysis, we usually adopt Average Variance Extracted(AVE) to examine the validity and convergence model of discriminant validity. Firstly, if the square root of the AVE is greater than 0.707, indicated the validity of converge is more advantage.Secondly, we compared whether the factor is greater than the variance with other factors, if AVE is greater than the square root of the correlation coefficient ,the factor structure is considered a good model of discriminant validity. Table 2 shows the correlation between various factors, the result is satisfactory.

Table 2 Factor standard deviation, AVE, and Pearson

| | | AVE and Pearson correlation coefficient | | | | | |
|---|---|---|---|---|---|---|---|
| var | s.d. | EE | PE | SI | FC | BI | UB |
| EE | 0.574 | 0.668 | | | | | |
| PE | 0.597 | 0.103 | 0.729 | | | | |
| SI | 0.640 | 0.234 | 0.240 | 0.593 | | | |
| FC | 0.686 | 0.301 | 0.247 | 0.422 | 0.690 | | |
| BI | 0.625 | 0.315 | 0.014 | 0.211 | 0.188 | 0.775 | |
| UB | 0.607 | 0.108 | 0.026 | 0.257 | 0.015 | 0.161 | 0.747 |

SEM includes direct and indirect effects. Direct effect is the direct impact between the independent variable and the dependent variable. Indirect effect is the independent variable by one or more intermediate variables affecting the impact on the outcome variables. Figure 1 shows the path model parameters of the test results. The results show that all hypothesis are supported. In addition, all statistically significant absolute value of standardized path coefficient is greater than 0.2, so it indicated that their corresponding assumptions are meaningful.

With the multiple correlation coefficient (R2) verification, the results show that the model explains user's behavior level up to 68% and explains user's BI more than 50%, and it has meet to use UTAUT model about 70% level. The standardized path coefficient estimates have shown in Figure 1.

## 5. Conclusion and discussion

We can draw the results as follows:

(1)Perceived Effort Expectancy in information technology for farmers will have a positive impact on behavioral intention.Because we can see from the sample tables that the farmers' education is generally low (about 77.1% of the farmers only up to primary school), information terminal is more simple operating,and more easily for them to use the new information system. If they can easily get the

information, and even get an unexpected surprise over their own knowledge and ability,they will enhance the extent of their willingness to accept.

(2)Perceived Performance Expectancy in information technology for farmers will have a positive impact on behavioral intention. Because the farmers have only gained the knowledge and information to increase revenue or pleasant feeling with the system,they will be willing to use. Otherwise, if only were there the advertising and entertainment information, the farmers will be reluctant to use the new system.

(3)Social Influence in information technology for farmers will have a positive impact on behavioral intention.In the countryside,there are village-style living environment,so they are very familiar with each other, and environmental factors on their adoption will be more apparent effect. Word of mouth has an important role in promoting technical services.

(4) Facilitating Conditions and behavioral intention in information technology for farmers will have a positive impact on use behavior.Here is an example,the favorable conditions to promote, on the contrary, the unfavorable conditions may also be due to give up.

In conclusion, the farmers will have a positive impact to adopt information technology services by the efforts of expectations, performance expectations, social and environmental factors.At last,we think there are some limitations for our survey sample, we will further improve in future research.

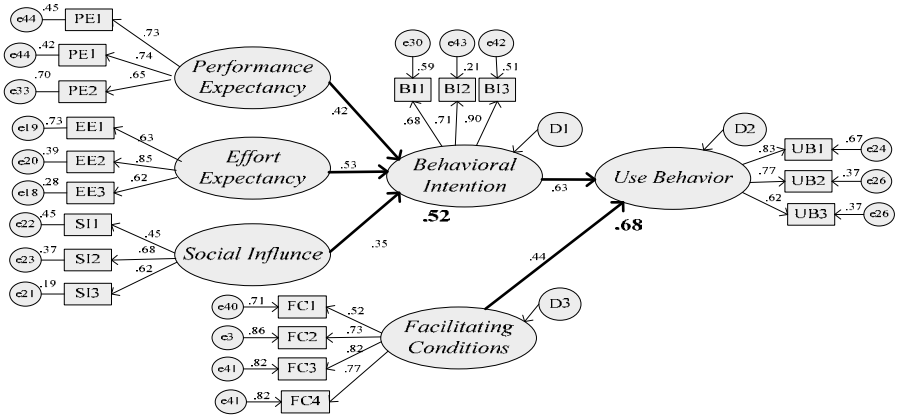


Figure 1. Path diagram of mode

## Acknowledgements

This study is a part of a project that is financed by the GuiZhou Technology&Union Fund. The author wish to acknowledge RUAN Fangming, JIN Jie in Guizhou Normal University for great support.

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